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base of the branch, though in this case growing upwards, in consequence of the position of the branch being reversed.

No. 4 *b* is part of the stem of a holly-tree, which stood in its natural position when operated on. It shows, also, that the principal portions of newly formed wood have grown chiefly on the upper lips of the spiral denudations.

No. 4 *c* is part of a branch which grew as nearly as possible in a horizontal position from the axis of the tree. It was denuded of bark over the upper half of its circumference, the bark on the lower half next the earth being still attached. The cells forming woody tissues in this instance have been produced for the most part in horizontal series, having little preponderance to the part nearest the base of the branch, which favours the correctness of M. Trecul's views, as stated above.

I have now, in this and a former paper, laid before the Academy the results, such as they are, of twenty years' experiments on this subject, which may appear a long period; but we cannot force the operations of nature, and must, therefore, be content to wait assiduously on her if we desire to elicit trustworthy data, such as can be useful to future students following in the same path of investigations.

SIR WILLIAM ROWAN HAMILTON, LL.D., M.R.I.A., read the following paragraphs in continuation of his paper—

ON ANHARMONIC CO-ORDINATES.

11. To myself it naturally appears as a *fourth advantage* of the anharmonic method, that it is found to harmonize well with the method of *quaternions*, and was in fact *suggested* thereby; though not without suggestions from other methods previously known.

12. Thus, if a, β, γ denote three given vectors, oa, ob, oc , from a given origin o , while a, b, c are three given and constant scalars, but t, u, v are three variable scalars, subject to the condition that their sum is zero,

$$t + a + v = 0;$$

then the equation,

$$op = \rho = \frac{t'aa + u'b\beta + v'c\gamma}{t'a + u'b + v'c},$$

in which r is any positive and whole exponent, expresses generally that the *locus* of the point p is a *curve of the r^{th} order*, in the given plane of abc ; which curve has the property, that it is met in r coincident points, by any one of the three sides of the given triangle abc . But the coefficients $t' u' v'$ are examples here of what have been above called anharmonic co-ordinates.

CAPTAIN BLAKELY read the following:—

CAPTAIN BLAKELY'S REMARKS IN CONTINUATION OF HIS REPLY TO MR. MALLET
AT THE MEETING OF THE ROYAL IRISH ACADEMY ON MAY 14, 1860.

MR. CHAIRMAN,—At the last meeting of the Academy a question was raised by Mr. Mallet, between himself, Dr. Hart, and me, as to which

of us first invented the method of construction now universally employed for large rifled cannon. If I rightly understand Mr. Mallet, he considers himself to have been the original inventor, and he is under the impression that he only asked Dr. Hart to calculate exactly the degree of strain necessary for each consecutive layer of tubes. He also believes that Dr. Hart gave him this calculation in 1854.

Dr. Hart, on the contrary, told us most distinctly that Mr. Mallet came to him for advice about a plan for making mortars of thick longitudinal voussoirs surrounded by hoops, and that he, Dr. Hart, had proposed the use of the present system of concentric tubes, as giving much greater strength with less weight.

I expressed astonishment at the date of 1854 being assigned as that of Dr. Hart's investigation, because, when the matter was more fresh in our memories, both Mr. Mallet and Dr. Hart had mentioned July, 1855, as the date. As my first cannon was made in the spring of 1855, I had, therefore, always considered myself the first discoverer.

Nothing, Sir, could be more unsatisfactory than to leave the question in such an undecided state; as, although I should never have trespassed on your valuable time to raise such a question, yet, as it has been raised by Mr. Mallet, I venture to hope you will allow me to throw some further light on it. First, I will say that I have found two published letters from Mr. Mallet, corroborating my view of the dates. One is to "The Press" (Nov. 14, 1857), and in it he states that Dr. Hart first communicated with him on this subject on the 6th July, 1855. In the other letter to "The Mechanics' Magazine" (Dec. 12, 1857, page 563), he says—"My first communications from Dr. Hart were received very early in July, 1855."

Now, Sir, I hope to be able to show where the mistake has arisen, viz., in some confusion as to the exact date of Mr. Mallet's valuable and interesting paper on the construction of artillery. That was read to this Academy, June 25, 1855, but not published till the year after, and I think the theory in question was communicated by Dr. Hart in the interim, and inserted in the paper. I found, on examination, that some parts of the paper, as published, must have been written in September, 1855, at the earliest, for at page 232 Mr. Mallet alludes to a proposal to shrink hoops on a 13-inch mortar, and this proposal was, I know, made by Colonel Eardley Wilmot, on September 25, 1855, and based on the success of a gun made by me in the spring of that year.

I must, in consequence of the discovery of this error in the date ascribed to Mr. Mallet's publication, retract my former admission, that he was the first to publish the theory. Not only was I before him, but also Mr. James Longridge and Sir Charles Fox. The late Mr. Brunel, too, early in 1855, proposed to Sir William Armstrong to make cannon on the same principle.

In looking for Mr. Mallet's published letter in "The Mechanics' Magazine," I found one from Dr. Hart (page 176, Feb. 21, 1857), defending the theory against severe criticism, and calling it his own—"My proposal, on which Mr. Mallet has acted," are the words used.

That Mr. Mallet did not then interfere and defend the theory, is, to my mind, conclusive that Dr. Hart's memory of the facts is the more accurate, and that he, not Mr. Mallet, was an original and independent inventor.

In persuading any person of this truth of the theory of built-up cannon, I have found the greatest assistance from Dr. Hart's calculation; and I dare say that if he has tried to convince a person less conversant with mathematics than himself, he has found the task easier since he has been able to say, "Captain Blakely has made several cannon on this principle, and they have shown powers of endurance far beyond what even he himself anticipated."

Although, therefore, I believe I anticipated Dr. Hart, I can conceive no process of reasoning by which persons taught by him can transfer their gratitude to me. I, consequently, am unable to attach the same importance to the question of priority which others seem to have done.*

Mr. W. R. Wilde exhibited a medallion plaster bust of the late John M. Kemble, Esq., and presented the following antiquities:—

1. From Dr. Kelly, Mullingar, an ancient Irish skull; 2. from Mr. Richard Murray, Mullingar, two ancient shoes, found in turf bogs (see Catalogue, p. 349); 3. from Dr. O'Meara, Carlow, a bronze pin; 4. from the Corporation of Dublin, gutta-percha casts of the ancient seal of that body.

The Academy then adjourned.

MONDAY, JUNE 11, 1860.

JAMES HENTHORN TODD, D. D., President, in the Chair.

GEORGE MEYLER, Esq., was elected a Member of the Academy.

The President drew the attention of the Academy to the beautiful electrotpe model of the box of St. Molaise of Devenish Island, which had been presented to the Museum a few years ago by Mr. West. The original has recently become the property of a member of the Council, and great interest, therefore, attaches to any historical fact which may be found in our ancient literature respecting this valuable relic.

The following legend occurs in an ancient historical romantic tale, entitled *Tannaipe bec pola*, a MS. of which is in the collection of Professor Curry, from whom the President received the following translation of the legend:—

"One Sunday morning when Diarmaid, son of Aedh Slaine, monarch of Ireland, was lying upon his couch, at or near Tara, he saw before him in the house four young clergymen. "What, is it possible," said Diarmaid, "that the clergymen are travelling upon the Sunday?" at the same time covering his head so that he should not see them. "It was